

# Chapter 3



Public policies for outdoor recreation are controversial. Equally conscientious citizens hold opposite views on what is and what should be done to conserve its resource base. Thus the Wilderness Society seeks to exclude roads from the hinterlands, and the Chamber of Commerce to extend them, both in the name of recreation. Such factions commonly name each other with short ugly names, when, in fact, each is considering a different component of the recreation process. These components differ widely in their characteristics or properties. A given policy may be true for one but false for another. . . . It seems timely, therefore, to segregate the components, and to examine the distinctive characteristics or properties of each.

Aldo Leopold  
*A Sand County Almanac, 1949*

# Master Plan for the North Study Area

## A. Introduction

The intent of this section is to present the fundamental principles of the master plan, delineate the physical configuration, and identify appropriate uses for the Sonoran Preserve. The City of Phoenix has a long and successful history of preservation beginning in 1924 with the acquisition of South Mountain Park. On a daily basis, physical and visual access to large parcels of open space positively affects our quality of life. Today, not unlike the 1970s, growth of the city has required that we act to preserve what has drawn many of us to live in the Valley of the Sun—the beauty of our environment. In keeping with the tradition of preservation, the magnitude of our actions today must be in proportion to the enormous growth the city has and will continue to experience. From 1990 to 2020 the valley is projected to attract two million residents and develop 344 square miles of land (MAG 1995). It is in the spirit of Phoenix's long-standing tradition of preservation that this master plan for the Sonoran Preserve has been developed. It reflects the recent planning efforts, studies, and scientific research presented in the previous chapter. In particular, the plan:

- Responds to the Desert Preserve Citizens Advisory Committee's recommendation to focus on undisturbed or near-pristine desert land
- Responds to the key resources identified to be preserved in the *Desert Preserve Preliminary Plan*, as well as the inventory process that began with the advisory committee and continues today with the wildlife and wash preservation studies
- Responds to the seven goals identified in the *Desert Preserve Preliminary Plan*
- Incorporates public concerns and comments generated by the three conceptual plans (concentrated, semiconcentrated, and dispersed) developed in 1996, which explored how the preserve could be configured
- Responds to the recommendations and lands identified for conservation in the *Desert Spaces* plan developed for MAG—all lands identified in this plan are included in the Sonoran Preserve in an effort to contribute to a regional open space network that benefits Maricopa County as well as City of Phoenix residents
- Responds to the recommendations and concepts affecting the built and natural environment identified in the *General Plan for Phoenix 1985–2000* and amendments, the *Cave Creek Wash Preservation Boundary Study*, and the *Findings of the North Sonoran Land Use Character Charrette* (McCarthy et al. 1995)

- Responds to the GIS suitability model developed by the City of Phoenix and ASU. This model has been a valuable tool used to manage the enormous amount of data generated in the planning of the NSA

In 1970 the population of Phoenix was 584,000, and with the addition of the planned Phoenix Mountain Preserve (Figure 3.1), approximately 81 percent or 34 square miles of paloverde-saguaro vegetation communities within the city limits had been included in the PRLD system in the form of desert parks or mountain preserves. This equated to a service level of one square mile of desert parks or mountain preserves per 17,000 residents. Given the 1996 population of 1,168,000, an additional 25,000 acres of desert parks and mountain preserves would be required to have a comparable service level. Significant areas have already been acquired. Deem Hills is 640 acres and is recommended for inclusion in the preserve system (Figure 3.2). Cave Buttes Recreation Area (2,200 acres; Figure 3.3) and Reach 11 (1,500 acres; Figure 3.4) are both district parks and represent 3,700 acres of parks that will be predominantly desert in character. This indicates an additional 20,660 acres of desert parks and mountain preserves would be an appropriate goal for the Sonoran Preserve based on the 1996 population. More important than the number of acres is the social and ecological value of the preserve and configuration of the lands to be included in the PRLD system.

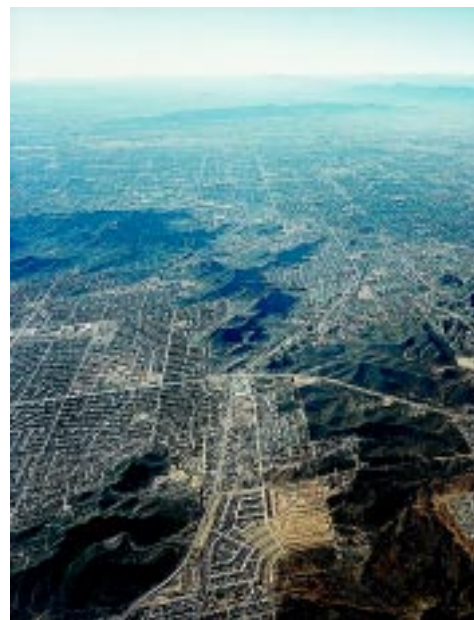


Figure 3.1 Aerial view of the Phoenix Mountains



Figure 3.2 Deem Hills



Figure 3.3 Cave Buttes Recreation Area



Figure 3.4 Reach 11 Recreation Area

The plan incorporates ecological principles regarding preserve design and ecosystem health and sustainability. This will enhance the ability to maximize ecological integrity and minimize the degradation of the landscape.

The Sonoran Preserve Plan includes 21,500 acres in the NSA (Figure 3.5). This represents 28 percent of the 110-square-mile NSA. Approximately three-quarters, or 16,800 acres, of the lands recommended for preservation are owned by the Arizona State Land Department. Approximately one-quarter, or 4,700 acres, are privately held lands. This ratio of state trust lands to private lands is approximately equivalent to the proportion of land ownership in the area and not a function of targeting either party (Figure 3.6).

The plan incorporates ecological principles regarding preserve design and ecosystem health and sustainability. This will enhance the ability to maximize ecological integrity and minimize the degradation of the landscape. These principles are briefly discussed in the following section. The plan only includes new lands in the NSA since specific lands in the SSA have been identified in the 1994 *Desert Preserve Preliminary Plan*. Figure 3.7 illustrates one of the guiding principles of the preserve, connecting the preserve to other significant open space within and beyond the city limits. Utilizing existing wash corridors and existing infrastructure corridors can provide both ecological benefits as well as greater recreational opportunities for the public.

## B. Ecological Principles

The structural pattern of landscapes are composed of three types of elements which can be found in any urban, rural, or natural landscape.

**Corridor:** A strip of a particular type that differs from the adjacent lands on both sides. Corridors can be wide or narrow, straight or curved, and connected or with gaps (Cook and van Lier 1994). Examples of corridors include a hedge of creosote, a small arroyo, a street, a major wash, or a river.

**Patch:** A relatively homogeneous nonlinear area that differs from its surroundings. A patch may be large or small, rounded or elongated, and smooth or lobed (Dramstad et al. 1996). Examples of patches include a neighborhood park, a planned community, South Mountain Park, or the entire Salt River Valley.

**Mosaic:** The composition and spatial organization of components (Forman 1995). For example, the region where hillslopes, creosote bush–bursage flats, tanks, wash bottom, and wash edge meet along Apache Wash is an important area because its diverse composition of vegetation types gives it both rich wildlife value and high visual interest. It represents a particularly dynamic landscape mosaic.

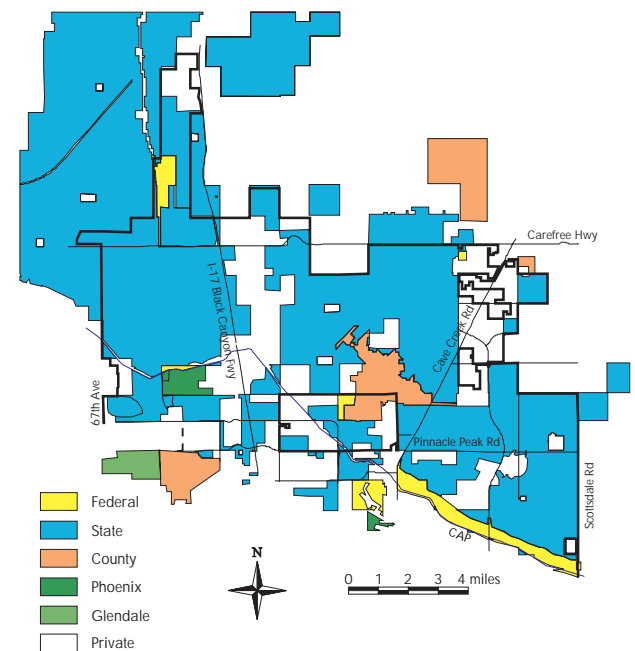


Figure 3.6 Land ownership

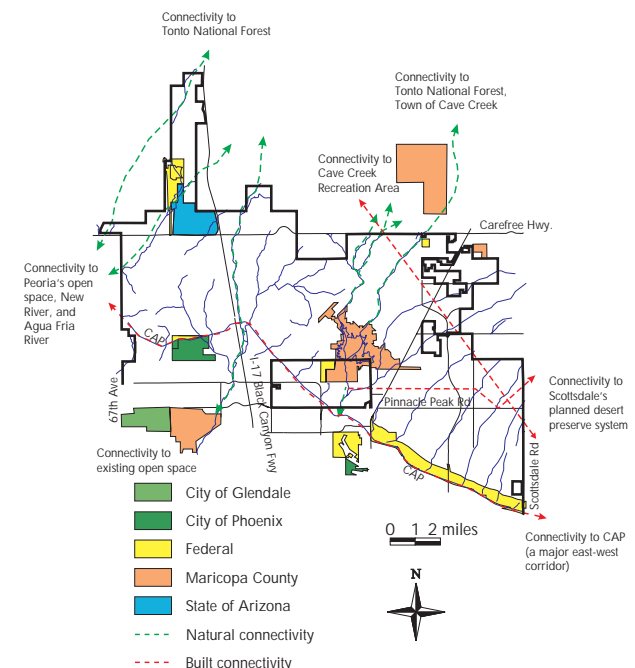
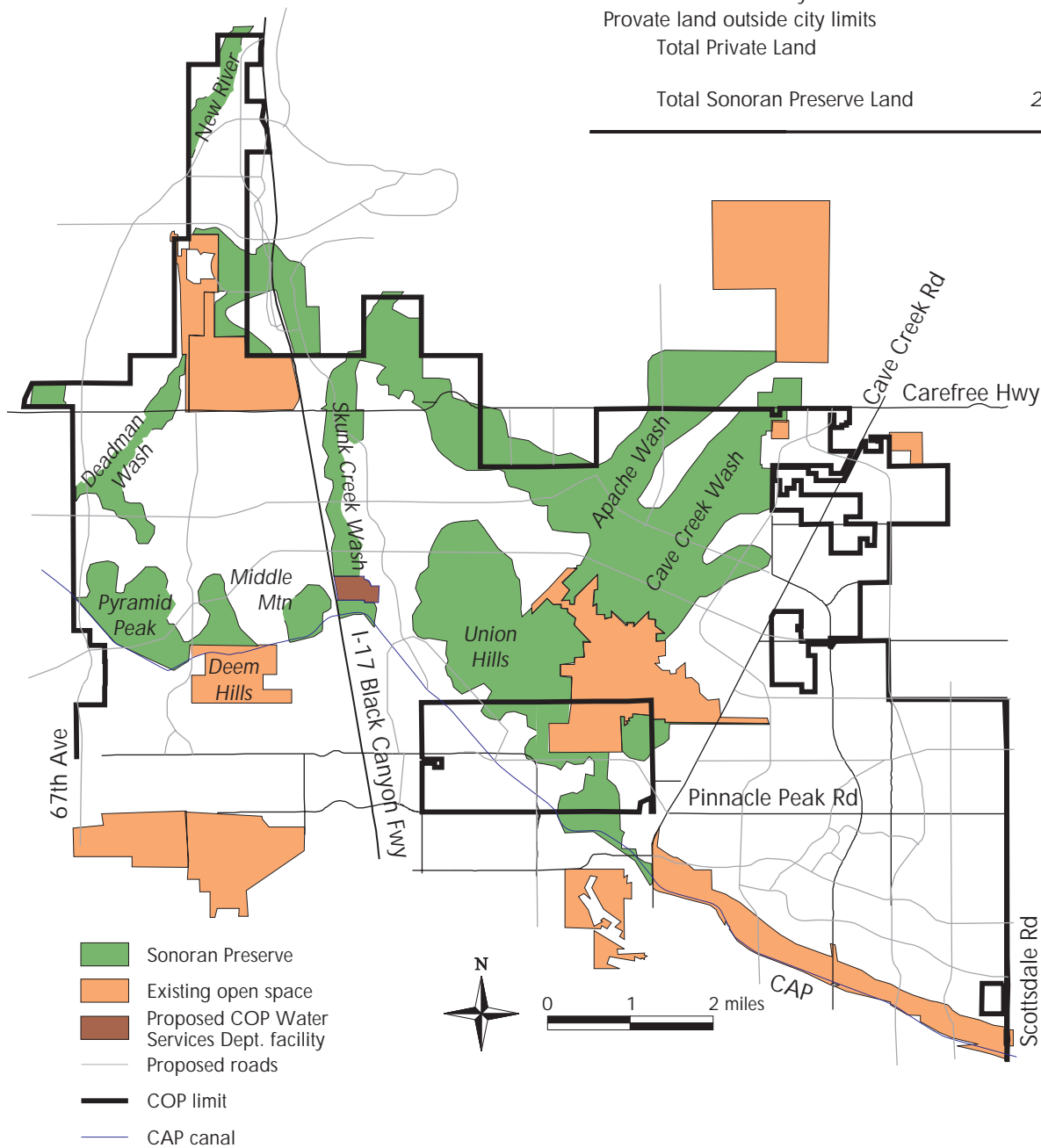


Figure 3.7 Openspace Connectivity

Sonoran Preserve Land Ownership and Location

	In Acres
State land within city limits	14,800
State land outside city limits	2,000
Total State Land	16,800
Private land within city limits	2,800
Private land outside city limits	1,900
Total Private Land	4,700
Total Sonoran Preserve Land	21,500



The deserts should never be reclaimed. They are the breathing-spaces of the west and should be preserved forever.

John Van Dyke  
*The Desert*, 1901

Figure 3.5 Sonoran Preserve Master Plan





Figure 3.8 Lookout Mountain, now completely surrounded by development, illustrates the loss of connectivity



Figure 3.9 Cliffs along Skunk Creek Wash provide valuable locations for burrowing wildlife



Figure 3.10 Tin Can Tank provides a unique experience for preserve users and an important resource for many species of wildlife

The following principles for landscape ecological planning are fundamental to developing the structure and content of a preserve with ecological integrity:

*1. Hydrologic processes should be maintained*

Watercourses should remain unfragmented and corridors should be as wide as possible.

*2. Connectivity of patches and corridors should be maintained*

This supports wildlife survival and movement (Figure 3.8).

*3. Patches should be as large as possible*

Patches provide numerous ecological benefits that include ameliorating microclimates, providing habitat, and absorbing rainfall. A few large patches should be included in a preserve system (Forman 1995).

*4. Unique and interesting mosaics of landforms and vegetation types should be included in the preserve*

The *Cave Creek Wash Study* identified mosaics as important physical conditions for wildlife species diversity (Ewan et al. 1996). They are also visually interesting, which is important for public use. While mosaics are not marked on the plan, the principle was considered in selecting land to be included in the preserve. Examples include the cliffs along Cave Creek and Skunk Creek and the tanks that are found throughout the NSA (Figures 3.9, 3.10).

*5. Diverse mosaics should be integrated into the developed human environment*

This expands the mobility and available area for wildlife. It also facilitates contact with nature, which is beneficial to human ecology.

*6. A preserve should be considered at multiple scales*

The function and vitality of a preserve cannot be sustained within a vacuum, especially when preserved land is located in an urban area. For example, at a regional scale, the preserve's connectivity to other significant undisturbed desert lands should be considered (Cook 1991; Cook and van Lier 1994; Forman 1995).

### C. Landforms

#### *Major Washes and Floodplains*

Floodways and floodplains for major washes should be included in the preserve. Floodplains plus buffers should be recognized as the limit of development and define the minimum boundary for washes identified for preservation. Cave Creek, Apache Wash, Skunk Creek Wash, and Deadman Wash should all be part of the Sonoran Preserve system (Figures 3.11, 3.12, 3.13, 3.14). These washes should not be fragmented and efforts should be made to maintain the natural hydrologic conditions within the preserve and further upstream.

The following discussion on the value of wash preservation is included because this is the first extensive effort to preserve wash systems within the City of Phoenix. Major washes and floodplains were identified in the *Desert Preserve Preliminary Plan* for inclusion in the preserve. *Desert Spaces* (MAG 1995), the ASU north area wash studies (Ewan and Fish Ewan 1998; Ewan et al. 1996), and the *State Standard for Watercourse System Sediment Balance* (Arizona Department of Water Resources [ADWR] 1996) all recommend against development within floodplains. Much of the lush vegetation associated with washes lies in the floodplains as well as on the edges of floodways. Natural desert washes and drainageways provide diverse and abundant plant and animal life. They act as nesting areas and travel corridors. In the NSA, land associated with washes often contains areas with rich archaeological and historic significance because they were often the sites of human migration and settlement. While drainageways and floodways are already regulated in the city because of the potential danger associated with flooding and storms, floodplains are not afforded the same regulation.

Floodplain boundaries are not fixed and over time a wash may shift or migrate. This natural process is called lateral migration. Lateral migration is a commonly observed occurrence in the southwest where the soils associated with washes tend to be erodible (ADWR 1996). Erodible soils in combination with ephemeral and often violent precipitation events necessitates the need for buffers where natural washes are to be preserved. Without a buffer, a wash that naturally migrates in a developed area can jeopardize private property. Thus, if wash migration is not considered in the land planning phase, the eventual and often necessary solution is to structurally stabilize the banks of the wash. Once a structural solution is implemented in one portion of a wash, increased velocities result and downstream degradation often occurs (ADWR 1996). Channelization speeds runoff, but also increases the peak discharge, often necessitating further downstream extension of the artificial channel section. And so each action creates the need for further construction and more concrete. (Dunne and Leopold 1978)

To effectively preserve washes, stormwater management must be considered based on complete hydrologic systems and not on a site-by-site basis.

#### *Mountains*

The mountains in the NSA should be included in the preserve. The minimum amount of land associated with preserving mountains should be defined by slopes greater than





Figure 3.11 Cave Creek Wash



Figure 3.12 Apache Wash



Figure 3.13 Skunk Creek Wash



Figure 3.14 Tank along Deadman Wash

ten percent. Hills and mountains to be included in the preserve are identified on the plan and include Union Hills, Pyramid Peak and its associated hills, and Middle Mountain (Figures 3.15, 3.16, 3.17). Other mountains that contribute to the network of open space in the area include Buffalo Ridge, Deem Hills, and Ludden Mountain. These landforms maintain gradual slopes almost in their entirety, so relying on steep slopes to limit development as a preservation tool would be relatively ineffective in this area. Hillside preservation should be based on the local landscape physiography rather than standardized hillside development controls.

All of the studies mentioned in the previous chapter recommend preservation of the mountains. Whether or not to preserve mountains is not the issue. How much of the mountains to preserve is the more difficult challenge. Unless the hillsides and mountains are included in the preserve, they will eventually become developed. Land adjacent to mountains is some of the most valued land in the Valley for residential development. Hillside development controls intended to protect public health, safety, and welfare are not well designed to accomplish preservation. Traditionally, mountain preservation has been defined by property lines and slopes not suitable for development. For large landforms like South Mountain and the North Mountains, this leaves substantial land available as open space. For small landforms, this process leaves small islands of limited visual, recreational, and ecological value.

One approach to defining the limit of a mountain is to analyze surface features, such as vegetation and soil types, associated with its physiography. Hillside vegetation extends well below 20 percent slopes—a common limit for hillside development—which indicates that restricting development based on slope does not respond to ecological conditions.

*An Open Space Plan for the Phoenix Mountains* hypothesized that “the Phoenix Mountains should be preserved as nearly as possible in their natural state for the enjoyment of all the people and for preservation of the special quality of Phoenix urban life to which they contribute” (PRLD 1971). Since the 1970s, the city land area has more than doubled; mountain preservation needs to increase as the city continues to expand.

Studies done by the PRLD illustrate the amount of land that would be preserved in the Union Hills at various slopes (Figure 3.18). Preserving only the lands above 20 percent slopes yields a series of small disconnected islands. These islands



Figure 3.15 Union Hills

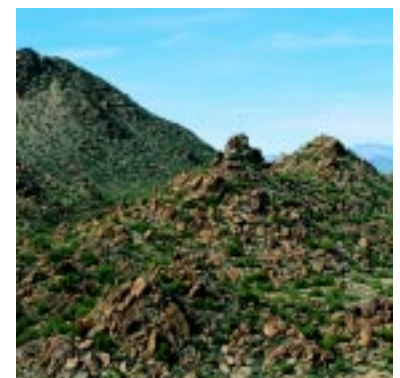
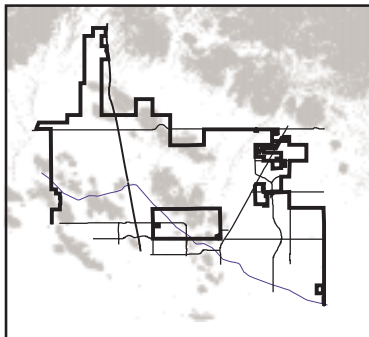


Figure 3.16 Pyramid Peak

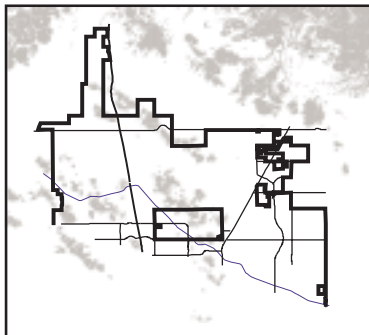


Figure 3.17 Middle Mountain

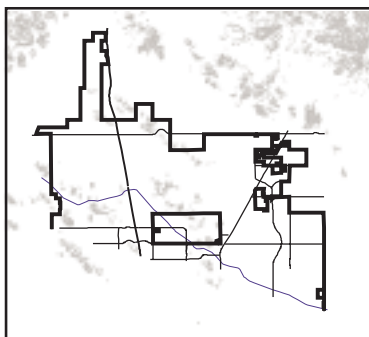




Connected pattern of land preserved at 10% slopes and steeper.



Disconnected pattern of land preserved at 20% slopes and steeper.



Insignificant parcels of land preserved at 30% slopes and steeper.

Figure 3.18 Slope analysis



Figure 3.19 The close proximity of Creosote Flats, Apache Wash, the Union Hills, and Tin Can Tank provides a rich mosaic of vegetation that is beneficial to wildlife

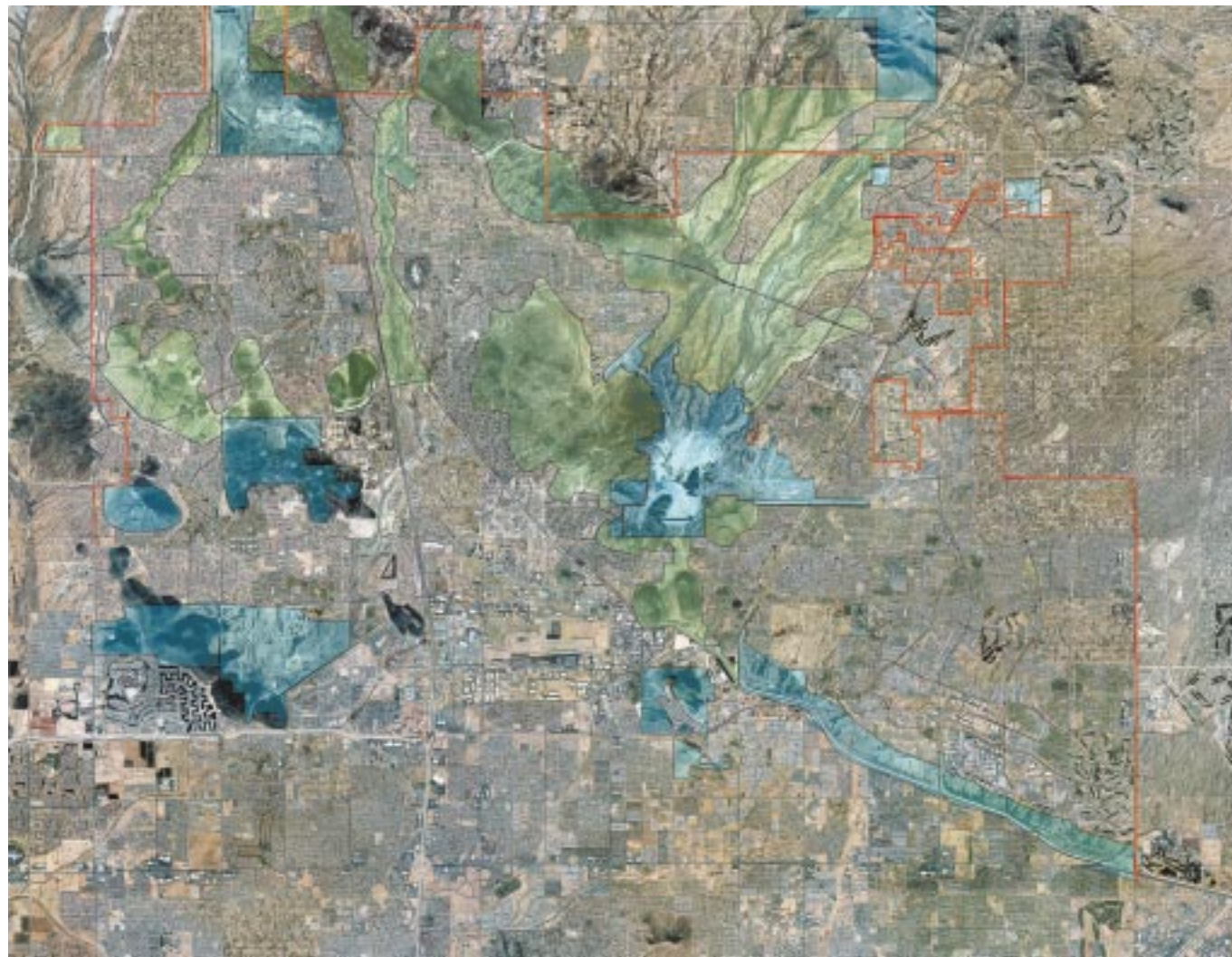


Figure 3.20 North Study Area with Sonoran Preserve

have limited value as open space. Not until the development is restricted to slopes of less than ten percent is a preserve created in the Union Hills that maintains connectivity. While limiting development to slopes of ten percent or less will decrease the amount of land available for development, this approach will increase the amount of land available for development that is adjacent to the Sonoran Preserve as well as increase the visual, recreational, and ecological value of the lands preserved. Mountains also represent ecological patches and, as such, would have greater wildlife value if larger parcels were preserved rather than small fragmented hilltops.

#### *Linkages and Transition Lands*

Mountains and washes are two types of significant lands identified for preservation. Landscape ecologists increasingly stress the need for providing connectivity (Dramstad et al. 1996; Forman 1995; Cook and van Lier 1994). Therefore, maintaining linkages between different forms is integral to the health of the Sonoran Preserve.

The transition area from mountains to creosote bush-bursage or washes is often called the *bajadas* or foothills. These areas contain a rich diversity of flora and fauna. They are often the sites of the greatest archaeological significance. Where washes and mountains are in close proximity, these transition lands have been incorporated into the preserve (Figure 3.19). Creosote bush-bursage between washes is another important transition area. As hunting and breeding grounds, these areas play an important role in the life cycle of many wildlife species. Where washes are separated by relatively small amounts of land, the creosote bush-bursage flats have been incorporated into the preserve. Other transition lands include small valleys surrounded by mountains. These areas offer a unique opportunity for users to be visually separated from the city. These areas greatly enhance the visitors' outdoor experience and where small valleys occur with significant enclosure, these lands have been incorporated into the preserve.





Figure 3.21 North Study Area without Sonoran Preserve

Transition lands and linkages contribute to preserving all types of lands present in the NSA. They also offer a greater diversity of terrain, increase the visual interest of the preserve, and provide areas of greater accessibility. Not all trail users want the challenge of climbing Squaw Peak—many prefer more gentle terrain which would be provided in the transition areas. These zones also offer appropriate locations for picnic areas, passive play areas, access points, and environmental education centers.

SWCA, Inc., an environmental consulting firm, worked with the Parks, Recreation and Library Department to develop two scenarios that illustrate how the NSA might develop. The first scenario assumed the Sonoran Preserve to be in place while the second scenario was based on open space being dedicated to the city through typical development practices. The scenarios are based on land uses and densities from the *General Plan for Phoenix 1985–2000*. Aerial imagery of existing developments within the City of Phoenix are used to illustrate how growth in the NSA would appear in the future.

Figure 3.20 shows the NSA with the Sonoran Preserve. The preserve, shown in green, plays a significant role in defining the urban and suburban development. Mountains, hillsides, and washes are preserved as well as the transition and flatlands, creating a connected and accessible open space system. Recreational opportunities for the public and habitat requirements for wildlife are greatly enhanced by the inclusion of the diversity of vegetation types and landforms that exist in the area.

Figure 3.21 illustrates how the NSA might develop without the Sonoran Preserve. Only the steepest slopes are left undeveloped, leaving a series of small, disconnected peaks of open space. The washes are developed to the edge of floodways to maximize the amount of land available for development. Ultimately, many of the washes in this scenario would require concrete lining or other structural flood control measures. Opportunities to be in a natural desert setting without the visual impact of urban and suburban development does not exist. Access to open space is limited and trails and other recreational opportunities is greatly compromised.

Mountains, hillsides, and washes are preserved as well as the transition and flatlands, creating a connected and accessible open space system.





Figure 3.22 Appropriate preserve uses provide opportunities for passive recreation, conservation, and environmental education



Figure 3.24 Multi-use nonmotorized trails



Figure 3.25 The existing CAP Canal provides the opportunity to make regional trail connections

### D. Public Use

#### Appropriate Uses

The Sonoran Preserve will be available to the entire community as well as visitors and will provide a broad range of functions for diverse groups of users emphasizing passive recreation, conservation, and environmental education. The following significant public uses are appropriate within the preserve.

#### Recreational use

Recreational use in the Sonoran Preserve will be similar to that of the mountain preserves. Uses appropriate for the preserve include hiking, bicycling, horseback riding, nature studies, picnicking, children's playground, sand volleyball, horse-shoes, and other passive recreational activities (Figure 3.22).

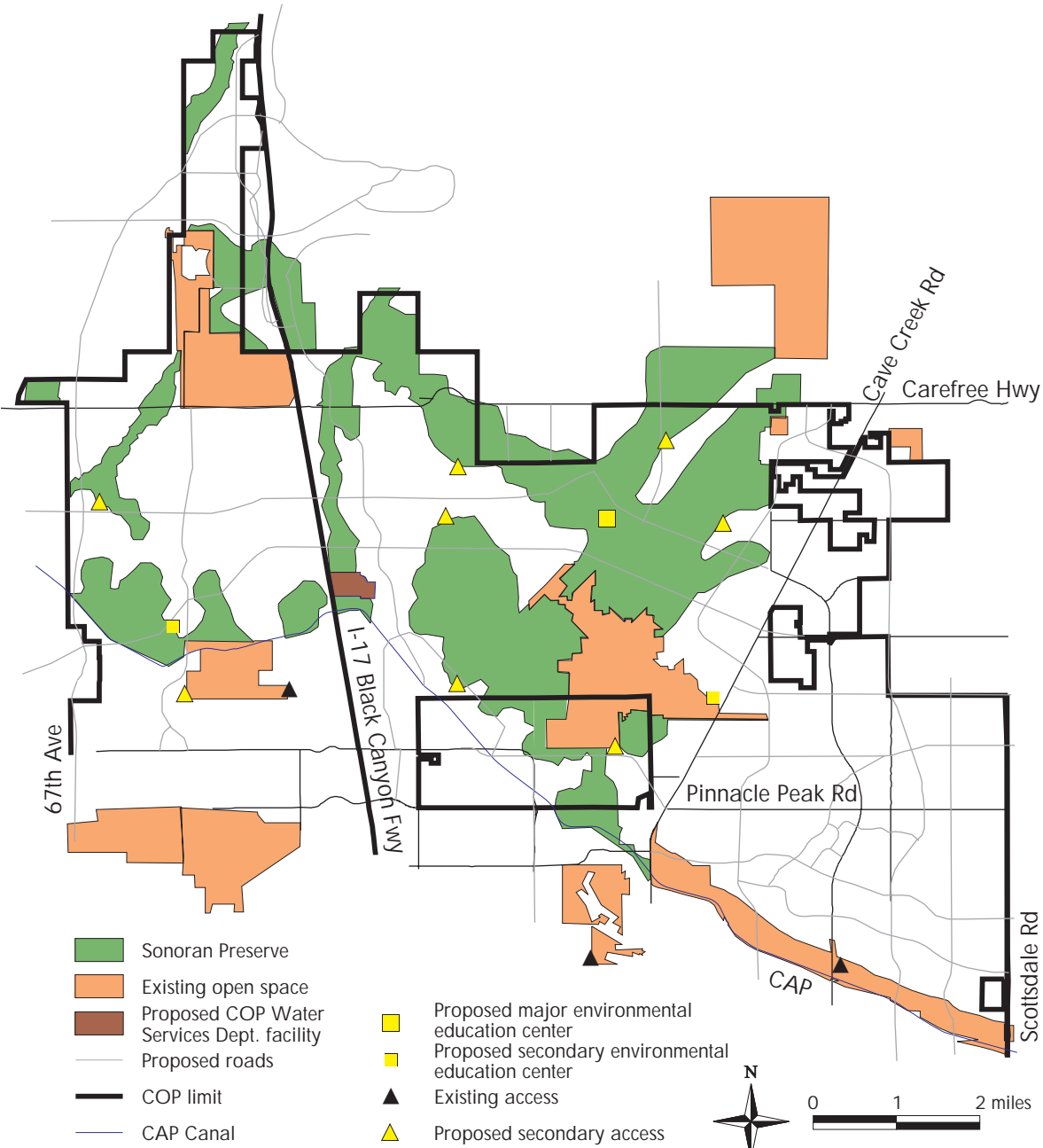


Figure 3.23 Access points

### Access

A hierarchy of entrance points has been developed to facilitate access to the Sonoran Preserve. In addition to facilitating access, developed entrance points will prevent potential problems of overuse and resource degradation currently experienced in the Phoenix Mountain Preserve system by concentrating access and use to designated areas (3.23).

Three major access areas have been planned for the Sonoran Preserve. Each site will be approximately 15 acres in size. Programmed elements may include sand volleyball, horseshoes, a playground, picnicking (family and group picnicking areas with ramadas), restrooms, drinking fountains, bicycle parking, informational signage, trailheads, parking lots, transit linkages, environmental education facilities, ranger station with dedicated parking, and interpretive trails, though every element may not be in every major access area.

A minimum of eight secondary access areas are planned for the Sonoran Preserve. Each site will be three to five acres. Programmed elements may include picnicking (family and group picnicking areas with restrooms and ramadas), trailheads, parking lots, transit linkages, secondary environmental education facilities, and ranger station.

Local walk-in trailheads will provide an important link to the community. Sites should be approximately one-quarter mile apart. Planned access for adjacent neighborhoods is required to avoid trailblazing between major and secondary access areas. It also encourages nonvehicular access to trailheads. Programmed elements may include standard signage, seating, drinking fountains, and bicycle parking.

### Trails

Trail use is the number one outdoor recreational activity for Arizona residents. Trails have a minimal impact on the natural environment and are relatively inexpensive to build. The *Desert Preserve Preliminary Plan* recommended multi-use nonmotorized recreational trails to best accommodate hiking, running, mountain biking, horseback riding, and interpretive education (Figure 3.24). In the NSA, the natural flow characteristics of the drainage provide an opportunity for major northeast to southwest trails. Mountains generally follow a northwest to southeast alignment accommodating additional trails. These natural features, combined with built features in the NSA (the CAP Canal and existing utility corridors), provide a structure for a trails plan (Figures 3.25, 3.26). MAG's *Desert Spaces* plan identified several existing and proposed trails that should be incorporated into the trail

network to provide regional connectivity. Other trails within the Sonoran Preserve can then link to this regional system. A comprehensive trails plan will need to be developed.

### Interpretation

The major environmental education center proposed for the Sonoran Preserve will be located west of Apache Wash. Programmed elements include indoor and outdoor educational facilities; interpretive exhibits and demonstration areas to highlight the ecology, prehistory, and history of the area; permanent and revolving exhibits; interpretive trails; meeting rooms; restrooms; administrative offices; and parking, kitchen, and concession areas. The center will be approximately 13,000 square feet on a site about four acres in size. This center is modeled after the environmental education center recently constructed at South Mountain Park (Figure 3.27).

Two secondary environmental education facilities are proposed for the Sonoran Preserve. Their siting is primarily based on providing equitable service and access in the preserve as well as giving consideration to environmental and cultural factors appropriate for interpretation. These facilities are smaller in scope than the environmental education center. Programmed elements would include multi-use meeting rooms, space for indoor/outdoor exhibits, interpretive trails, restrooms, parking, and staff offices. These centers will be 1,000 to 4,000 square feet on sites approximately two acres in size.

Interpretive centers provide places for children and adults to take field trips to learn about the Sonoran Desert ecology (Figure 3.28). Special guided walks and research would enhance lessons dealing with environmental awareness and conservation, understanding of natural processes and species diversity, and an understanding and appreciation of human dependency on the natural environment. Local cultural and natural history would be interpreted through exhibits and activities.

In the NSA many infrastructure improvements are necessary to support adjacent urban development. Roads, water transmission mains, and sewer interceptors will need to cross the preserve in some locations in order to service development. Crossings should be minimized and, when absolutely necessary, infrastructure improvements should be combined into common corridors to minimize disturbance. Right-of-way shall be acquired separately with funds other than those allocated for preserve acquisition. Where lands are disturbed in the preserve, restoration costs shall be accommodated by the responsible party per guidelines provided by the PRLD.



Figure 3.26 Existing utility corridors provide opportunities for regional trail connections



Figure 3.27 South Mountain Park's new environmental education center



Figure 3.28 Park ranger teaching children about Sonoran Desert plants





Figure 3.29 Wash corridor lined with concrete provides minimal benefit as open space to either wildlife or the public



Figure 3.30 The erosive impact of a structural flood control solution on the natural vegetation downstream



Figure 3.31 Eminent loss of existing native vegetation along a wash due to upstream development

### *Inappropriate Uses*

Due to their negative impact upon the preserve, many uses are inappropriate and shall not be allowed within its boundaries. These uses negatively impact natural resources because of their spacial needs or land use intensity. They include such elements as large museums, golf courses, recreational vehicle parks, developed overnight camping, agriculture, stables, active recreation, mining, grazing, and all-terrain vehicles. These uses should be prohibited. In addition, uses or activities already prohibited by city ordinances in parks and preserves will be prohibited in the Sonoran Preserve. Fires, except where designated in picnic areas, cause potential hazards to people and the preserve. Irrigation ditches and canals create long continuous barriers within the preserve and destroy the natural environment. Negative visual impacts to preserves are caused by communication antennas, towers, and overhead telecommunication and power lines—these should be minimized in the preserve.

While these uses are inappropriate within the preserve, some may be very appropriate for adjacent lands. For example, when located adjacent to the preserve, golf courses, schools, and neighborhood and community parks increase the quantity of open space, help preserve views and wildlife corridors, and provide services to the public that need not be replicated in the preserve. Appropriately located and designed residential development can help instill a sense of public ownership, create a safer and more secure site, and allow for integration of the desert.

### **E. Preserve Ethic**

The boundaries of the Sonoran Preserve need not be the extent of the effort to preserve the natural environment within Phoenix. Historical examples exist that demonstrate the integration of human values with ecological values. For example: Village Homes in Davis, California; Frederick Law Olmsted's Emerald Necklace in Boston; The Woodlands outside Houston, Texas; Frank Lloyd Wright's Taliesin West; and Paolo Soleri's Cosanti in Paradise Valley. Adjacent land use practices can contribute to Phoenix's preservation efforts, particularly with regard to treatment of secondary washes, scenic corridors, and the preserve edge. These resources were identified in the *Desert Preserve Preliminary Plan*. PRLD will continue to participate in the development review process and work with Development Services Department and the Planning Department to help ensure sensitive lands outside the preserve are developed appropriately. Specific recommendations follow.

### *Secondary Washes*

Washes not included in public ownership can still contribute to the preserve and are a valuable part of the hydrologic process. Degradation of these washes will ultimately have a negative impact on the major washes included in the preserve (Figures 3.29, 3.30, 3.31). These smaller washes, when left in a natural condition, prevent erosion, filter pollutants, and provide connection to the preserve for humans as well as wildlife.

Tucson residents have long realized the significance of stormwater, and in 1988 began a stormwater management study. Citizens had concerns about flooding as well as the preservation of natural washes. The city investigated the feasibility of nontraditional solutions—solutions other than the typical lining of wash banks with concrete. Of 77 miles of washes surveyed, 98 percent of the riparian habitat was recommended for preservation as naturally vegetated watercourses. A variety of approaches were recommended, but what is most significant is that the City of Tucson Department of Transportation has estimated a savings of \$413 million over the next 30 years due to a shift from an emphasis on structural solution to nonstructural solutions (Department of Transportation 1996).

In light of this forward-thinking precedent, the following principles are recommended along secondary washes outside of the preserve:

- Washes should be left in their natural state and buffered to ensure long-term preservation
- Nonstructural solutions should be considered for their economic as well as ecological benefits
- Policies or standards should be developed to protect wash corridors in developed areas

### *Scenic Corridors*

The additional rights-of-way, easements, and/or building setbacks associated with scenic corridors and drives can provide necessary desert linkages between desert and mountain preserve areas and other open space. The scenic quality along roadways often paints the most memorable image of a city to both residents and visitors. Scenic corridors and drives are currently proposed for roadways in the NSA.

Cave Creek Road provides an example of a linear corridor that contributes toward desert preservation. In 1992 the City Council approved a general plan text amendment extending the southern end of the Desert Foothills scenic drive from Pinnacle Peak Road to the northern edge of the CAP

Canal. In the same action, it approved a change to the transportation plan map of the *General Plan Peripheral Areas C and D*, adding a category of “Designated Scenic Corridor,” and deemed Cave Creek Road as such (Planning Department 1987). The general plan amendment encourages a 205-foot setback from the roadway centerline. However, the City Council recognized that this width may not be feasible for all land parcels. In June 1997, the City Council adopted scenic corridor design policies for the Carefree Highway (Planning Department 1997c). Pinnacle Peak Road and Scottsdale Road are also designated scenic corridors per the transportation plan.

Generally, the scenic corridors identified in north Phoenix provide a network of north-south and east-west corridors. The scenic corridors as shown in the *Desert Preserve Preliminary Plan* differ somewhat from the transportation plan maps but match those approved by the Desert View Tri-Villages Planning Committee, with the exception of one alignment. The routes approved by the village planning committee include Tatum Boulevard, existing and proposed extensions of Happy Valley Road, 51st Avenue, Cave Creek Road, and a section of Dixileta Road.

No established citywide scenic corridor guidelines have been approved by the City Council. To truly integrate scenic drives into the preserve, these guidelines must be established. The scenic corridor concept should be expanded to include other uses such as trail corridors, wildlife habitat, and view corridors (Figure 3.32).

#### *Adjacent Land Use and Edge Treatment*

Dramstad et al. (1996) describe the edge as the outer portion of a patch where the environment differs significantly from the interior of the patch. Considering the preserve as a patch, the edge will frequently be formed by urban development. This edge requires careful attention due to the potential impact adjacent development can have on the health of the preserve. Invasive species can encroach into the preserve and have a detrimental impact on the native flora and fauna.

Another possible detrimental effect is the edge becoming a barrier to users and wildlife (Figure 3.33). For users, access into the preserve should be convenient and readily identifiable and not obstructed by continuous private development. This often occurs where residential lots back up to the open space edge with no accommodation for public access. Possible solutions to this scenario include developing streets that form the edge of the preserve, thus providing physical and visual access. Other solutions could include designing

cul-de-sacs ending at the preserve edge to allow physical and visual access (Figure 3.34). For wildlife, the edge should not be abrupt. One method of accomplishing this is to use native vegetation in developments adjacent to the preserve, thus creating a gradual transition.

The edge of the preserve is a critical point of interaction between the built and natural environments and requires sensitive consideration. In the past, many edges of open space in the Valley have been defined by political, administrative, or legal boundaries and not the natural factors that motivated preservation in the first place. Design guidelines need to be developed for adjacent development and edge treatment.

#### *Roads, Wildlife, and Users*

One million vertebrates per day are killed on roads in the United States. The species affected include deer, wolves, and bats (Forman 1995). In 1997, road kills within the city of Phoenix averaged 194 per week. While statistics are not available differentiating the total domestic from native species, native wildlife roadkills within the city limits include coyotes, javelinas, rattlesnakes, and blacktailed jackrabbits. White-tailed deer, mule deer, and javelina roadkills have been reported to the Arizona Game and Fish Department along the City of Phoenix portion of the Carefree Highway. Of the many techniques developed to respond to this problem, reflectors, mirrors, repellents, various fencing types, lighting, and wildlife crossing signs all show moderate or no success (Forman 1995). Underpasses, tunnels, and overpass designs have been developed and tested for use by animals in many countries including the United States. The wildlife friendly underpass solution should be combined with the need for grade-separated wash crossings and safer pedestrian crossings.

The physical configuration of the plan takes into account the ecological principles set forth in this chapter as well as the considerations for public access and appropriate edge treatment. The 21,500-acre preserve includes hills, washes, and transition lands representing a contiguous and diverse area of open space. The remainder of this document outlines management and land acquisition strategies necessary for realizing the plan.



*Figure 3.32 One residential lot on a hillside can have an enormous negative visual impact on an entire community*



*Figure 3.33 Residential development adjacent to open space can create a barrier for the public and wildlife*



*Figure 3.34 For commuters the visual experience provided by the preserve has a positive impact on our daily quality of life*